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Front Cover: *N. adnata* (a lower pitcher and part of the rosette). Photo by Charles Clarke. See article on page 4.

Rear Cover: A rosette & lower pitcher of *N. alata* (considered by some to be *N. eustachya*). Photo by Charles Clarke. See article on page 4.

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Editorial

by JAN SCHLAUER

Dear fellow carnivorous plant enthusiasts,

All this time passed by, presenting us with news and excitement, posing new questions where old ones were apparently answered, and revealing more and more the oddity and beauty of Nature. Yes, it is twenty-five years since you received your very first issue of Carnivorous Plant Newsletter (CPN), from its first days a steady source of information and delight for all of us strange people who seek the most unusual amongst the (only seemingly) most peaceful creatures. The development of the newsletter was the achievement of two men, viz. Donald E. Schnell and Joe A. Mazrimas, and the additional labours of Leo Song and Larry Mellichamp. Under their lead, CPN grew and flourished, gaining reputation among amateur plant lovers and professional botanists alike. Its popularity with amateurs is testified by the many excellent field trip reports by correspondents from around the globe and by CPN being the official registration authority for all carnivorous plant cultivars. The facts that CPN is reviewed regularly by the Kew Record of Taxonomic Literature and that recently even formal descriptions of new species appeared in CPN are sufficient indication of its standing in the professional community.

But now, Don Schnell has decided to retire from his duties as a co-editor of CPN. I want to take this opportunity to express my gratitude and certainly also the gratitude of many others for all the work he invested in the foundation and steady improvement of this fine piece of carnivorous plant literature. Barry A. Meyers-Rice and I have been appointed as successors to fill the gap Don leaves behind. It certainly cost us some thought before we accepted this honour because we were well aware of the difficulties in fulfilling the high standards set. All I can say now is that we will try our very best. But, dear readers, please do not forget to remind us of our shortcomings wherever perceived, as we aim to present you with the best we can manage to produce here.

The fact that I will be the first CPN staff member from the Old World does not only manifest the "International" nature of the ICPS but it is at the same time a special obligation to me. Together with Joe Mazrimas and Barry Meyers-Rice, we have settled on a new, internet-based editing procedure in order to streamline it across national and continental borders. This brings about some changes also for the authors. Please consult our new "Instructions to Authors" (printed in this issue) previous to the preparation of manuscripts intended for publication in CPN.

Let me close with an announcement. We are planning to devote a special issue of CPN this year to *Aldrovanda vesiculosa* (an Old World dweller like myself!), which could in comparison with its close American relative (Venus's fly-trap, Darwin's "most wonderful plant") be called the "most neglected plant", regarding its outstanding position in systematics as well as its ecology, rarity and cultivation. Please consider if you could contribute to this issue and submit your material before July 5, 1997. Thank you very much in advance.

Another Nice Trip to Sumatra

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Keywords: travelogue:*Nepenthes*---travelogue:Sumatra

Introduction

Sumatra is definitely the trendy location for *Nepenthes* explorers at the moment. In the last two years, seven species have been described from the island and the list of Sumatran *Nepenthes* now rivals that of Borneo in size. Over the last eight years, I have spent a considerable amount of time exploring Borneo and studying its *Nepenthes*. During that time, numerous reports of new species from Sumatra surfaced and the urge for me to visit the island and see some of them grew and grew. The CPN article by Hopkins *et al.* (1990) added further fuel to the fire, as it became apparent to me that it was possible to see most of the Sumatran species in a short space of time and with relatively little effort compared to the exertions required to find many of the Bornean *Nepenthes*. Moreover, it seemed that a number of Sumatran *Nepenthes* were not very well understood taxonomically and the longer a situation such as that goes on, the more difficult it becomes to sort out.

Finally, in September 1995, I got my chance to visit Sumatra. A letter earlier in the year from a friend, who thought he had found a new species from Sumatra, helped bring my plans to fruition. We decided the best way of finding out the identity of his plant would be to go to Sumatra and find it again, so that we could compare it with the other species in the region and see if it was new. This provided the perfect excuse to try to see as many other *Nepenthes* as possible while we were there.

This article provides an overview of the species we saw and is largely a reply to the article by Hopkins *et al.* (1990). Where possible, I have included discussion of the newly described Sumatran species, though we did not manage to find all of these. The map of Sumatra provided by Hopkins *et al.* (1990) includes all of the important destinations we visited and can be used in conjunction with this article.

North Sumatra

Our trip started at Medan, the capital of North Sumatra. I had been told by many people that Medan was a place to avoid, but did not find it to be that bad (especially when compared to Sibolga—see below!). We drove from there to Berastagi, armed with the information that there were numerous lowland *Nepenthes* by the road on the way. This may well be the case, but we had almost reached Berastagi before we realised we had left Medan! Any plants that might grow along this stretch of road would have to wait for our return. From Berastagi, we drove around the edge of Lake Toba to Prapat. We saw a lot of *N. tobaica* on the way, but nothing else. Most of the pitchers were greenish-yellow, but a couple were a nice coffee-brown colour.

The next day, we climbed Gunung Pangulubao. Since Kurata (1972) described *N. rhombicaulis* from this mountain it has become something of a beacon for *Nepenthes* enthusiasts who visit Sumatra. Recently, *N. ovata*, *N. mikei* and *N. xiphioides* have been described from G. Pangulubao (Nerz & Wistuba, 1994; Salmon & Maulder, 1995), making it one of the richest locations for *Nepenthes* species in Sumatra. The climb to and from the summit can be done in a day and we saw *N. rhombicaulis*, *N. ovata* (Figure 1) and *N. spectabilis* there. On the way down we saw *N. tobaica*, *N. ampullaria* and a species of *Paphiopedilum*, but it was not in flower.

Despite an extensive search around the summit area, we did not see *N. mikei* or *N. xiphioides*. However, the summit ridge of G. Pangulubao is quite long and can be reached from more than one direction, so we assumed that we were simply not

in the right place at the right time. From the photos which accompanied the description of *N. mikei* (Salmon and Maulder, 1995), there seems to be no doubt that it is quite distinct from any other species, though *N. xiphioides* is now considered a synonym of *N. gymnamphora* (Schlauer, 1996).

If *N. rhombicaulis* was the only known species of *Nepenthes*, it would probably be considered fairly spectacular. Unfortunately, it is not and almost all other *Nepenthes* are more interesting than it is! The upper pitchers are rarely produced, though we did manage to find one small one (Schmid-Hollinger (1994) managed to find more) and the lower pitchers are often embedded in moss and detritus. It grows just below the summit, often below the point at which mossy forests occur. In this sense, it reminded me of *N. hirsuta* of Borneo, which also grows in the litter layer of montane forests. Hopkins *et al.* (1990) were not entirely sure about the identity of some of the pitchers they found on G. Pangulubao. The two photographs at the top of page twenty-one of their article illustrate *N. rhombicaulis*, though I am not 100% certain about the one with the large brown peristome—that looks a bit like *N. ovata*—but a lot more information is required before any conclusions can be drawn. Perhaps those authors now know the answer themselves?

Fortunately, the extreme development of the peristome of *N. ovata* pitchers makes up for the drabness of *N. rhombicaulis*. *N. ovata* is largely epiphytic, but also grows in mossy banks beside the trail. The lower pitchers are superb, with expanded dark red peristomes and light green cups. The upper pitchers are less spectacular, but are a very elegant shape. *N. spectabilis* was not quite as common as we had expected and we got the impression that collectors had taken a bit of a toll on the population, partly because very few immature plants were visible. However, we did not get the chance to examine this species on Gunung Sinabung, so we cannot really draw any serious conclusions about the densities at which it grows. We climbed down G. Pangulubao using a different path to the one we climbed up. We thought this would increase our chances of seeing *N. mikei*, but the path did not follow the direction we expected it to and all we saw was more *N. tobaica*. Our guide then took us to a site where he said another *Nepenthes* grew. We walked across rice paddies for about twenty minutes, until we came to a small patch of swampy vegetation. The plants turned out to be *N. ampullaria*, but the leaves were quite different in shape to those of the Bornean *N. ampullaria*. They were larger, more acute at the apex and the lateral venation was a lot more pronounced. We could not figure out what they were until one of the local children picked one of the pitchers out from the depths of the swamp!

The next day, we drove down to Sibolga to look for *N. sumatrana* (Figure 2) and the other lowland species known from that area. Since Danser (1928) united them, *N. sumatrana* and *N. treubiana* have both been known by the latter name and the only other known location was in Irian Jaya. Jebb (1991) examined the herbarium specimens of the Sumatran and Irianese populations and felt that there were some substantial differences, but stopped short of reclassifying either of them. Nerz & Wistuba (1994) concluded that the differences between the plants at the two sites were sufficient to reclassify them and the Irianese populations are now known as *N. treubiana*, whereas the Sumatran ones have been returned to their original name of *N. sumatrana*.

We were also able to confirm the observation of Hopkins *et al.* (1990) that the distribution of *N. tobaica* does extend some distance west of the lake towards Sibolga—we found plants as low as 700 m above sea level. Growing with *N. sumatrana* we saw more *N. ampullaria*, *N. gracilis* and a few pathetic specimens of *N. reinwardtiana*. We found a number of plants of the black form of *N. gracilis* (both here and close to Sibolga) but, contrary to the opinions of Hopkins *et al.* (1990), I think they are pretty ordinary compared to the black ones from north-western Borneo!

A little further down the road we saw a large stand of what is usually referred to as the Sumatran *N. alata* (Back cover). Some people feel that the Sumatran populations of *N. alata* differ sufficiently from those of the Philippines to be considered

a separate species. Others do not and it will be interesting to see how the current monographers such as Martin Cheek and Matthew Jebb treat these populations. If the Sumatran populations are returned to species status, they will assume their old epithet: *N. eustachya*.

Later that day, we arrived in Sibolga and set about looking for a hotel. Thirty minutes later, having decided that it was the grubbier little town we had ever had the misfortune to stumble across, we decided to drive on to Bukittinggi, 350 km away.

West Sumatra

We got to Bukittinggi at midnight, exhausted but glad to be somewhere a little more civilised. This pleasant town is best known for the three large mountains which surround it: G. Merapi, G. Singgalang and G. Sago. Unfortunately, we only had time to climb one of these on this trip and we chose G. Singgalang.

The climb up Gunung Singgalang starts from a radio repeater station at about 1400 metres above sea level. From there, it was a relatively easy (though long) walk up a clear path to the summit. A short distance along the trail, we found a number of plants of *N. gymnamphora* growing in a bamboo thicket (Figure 3). The moss forest further up the trail was very pretty, but the trail was strewn with rubbish and there were few *Nepenthes* to see. We found one very impressive plant of *N. bongso* (Figure 4) on the way up, but apart from that, we had to wait until we reached the crater lake near the summit to see any more. *N. bongso* has had a very confused history and even though much of this confusion has now been untangled (see below), it is still a difficult plant to distinguish reliably.

The crater lake at the top of G. Singgalang is quite picturesque, but is also surrounded by piles of rubbish. The actual summit is a little further along the trail, at the far end of the lake. We spent an hour walking up to this, as I was expecting to see the best stand of *Nepenthes* on the mountain there, but was surprised to find that none grew there at all: they are all found around the shores of the lake and all of them are *N. singalana*. This species is quite similar to *N. bongso*. The upper pitchers of *N. singalana* are very plain, but the lower ones are more interesting and are often a nice black colour. *N. pectinata* was also known from this mountain (as well as several others in the region), but Schlauer and Nerz (1994) showed that the specimens upon which the description of *N. pectinata* was based consisted of the lower pitchers of *N. gymnamphora* and the upper pitchers of *N. singalana*. *N. pectinata* is no longer considered to be a valid species. Although the climb up G. Singgalang was a good way to learn about the differences between *N. bongso* and *N. singalana*, it is not a mountain I would recommend to someone who is pressed for time and who wants to see as many *Nepenthes* as possible!

Our next destination was an area west of Bukittinggi, called the Harau Canyon. We were not sure what we would find here, but thought it was worth taking a look. *Nepenthes tenuis*, a species recently described by Nerz & Wistuba (1994) was apparently collected on a sandstone ridge above the river Tjampo. Given that the Harau Canyon contains a lot of steep sandstone ridges, it seemed like a good place to look, but we did not have the time to get serious about it. Nearby we found some nice stands of *Nepenthes*, in particular *N. alata*. I wanted to find two plants in particular: *N. adnata* and *N. rafflesiana* var. *longicirrhosa*. The former was originally described invalidly by Tamin & Hotta (1986), with the formal description coming from Schlauer and Nerz (1994). *N. rafflesiana* var. *longicirrhosa* was also described invalidly by Tamin & Hotta (1986), but has not been mentioned since.

Upon finding *N. rafflesiana* var. *longicirrhosa*, I was immediately certain that it was not a variety of *N. rafflesiana* at all and I do not know what Tamin and Hotta (1986) were thinking of when they classified it as such. After half an hour of head scratching, the penny dropped—this plant was the recently described *N. longifolia* (see Nerz and Wistuba (1994)). *N. longifolia* is so closely related to *N. sumatrana* that I sometimes find it difficult to see how these two can be distinguished from each other at all (Figure 5). The pitchers of the two are different in colour and there are some very minor morphological differences, but in all other respects, including

ecology, they are very similar indeed. Growing near *N. longifolia* and *N. alata* were *N. ampullaria*, *N. gracilis* and *N. albomarginata*. The *N. albomarginata* from this part of Sumatra are large and robust compared to those from Borneo and seem to be bigger than those from Peninsular Malaysia as well. Shivas (1985) commented on these differences and it does seem that this species exhibits greater geographical variations than most.

We saw some quite large and unusual plants of *N. gracilis* and given that we had spent the whole day looking for *N. adnata* without success decided that maybe that is what the latter species looks like. Just as we were about to give up altogether, we found the real thing (Front cover). *N. adnata* must be one of the smallest of all *Nepenthes*, but it is also one of the prettiest. The basal rosettes rarely exceed 15 cm in diameter and the pitchers rarely exceed 8 cm in height, but the whole plant is very beautiful and grows among thick mosses. It is an outstanding addition to the genus and it is nice to think that even after all this time and exploration, there are still some great botanical discoveries to be made in the forests of southeast Asia. Satisfied, we returned to Bukittinggi to prepare for the next stage of our trip.

The plant we both wanted to see most was *N. inermis*. This species is known from a few mountains in West Sumatra and we wanted to visit Gunung Gadut, a locality which has only recently come to light. This mountain is also home to *N. carunculata* var. *robusta*—an extreme variety of this species described by Nerz and Wistuba (1994). Our U.S. Air Force map (albeit an old one) showed various paths and trails going up to this mountain from the town of Solok, which is near the better-known Gunung Talang. We looked for these trails for almost half a day, but could not find them. Perhaps they have been reclaimed by the jungle since the printing of the map? Or, more likely, we simply looked in the wrong places! We then decided to drive down to Padang and see if there was a way up from the other side. Eventually we found a trail up from this side, but we did not have enough time to complete the walk. Having failed at the first attempt, we had to decide whether or not to try again the next day, or whether to climb Gunung Talang instead. We chose G. Talang, as we wanted to be absolutely sure of seeing *N. inermis*.

Our ascent of Gunung Talang was a rather unusual one and I suspect that not many westerners have climbed it using the paths we did! We hired a few local guides for the day and they took us along their hunting trails in a slow, winding ascent of the mountain. We did not quite reach the summit, which was a minor disappointment, but to climb such a spectacular mountain along virtually unused trails was great. We saw a lot of *Paphiopedilum* orchids, but once again, they were not in flower. The mossy forest on this mountain was particularly impressive. *N. gymnamphora* grew in dark places on the lower slopes of the mountain. Some of them had more substantial peristomes than others we had seen and I wondered if this was the plant named *N. rosulata* by Tamin and Hotta (1986). If so, any differences between it and *N. gymnamphora* are definitely not sufficient for it to be distinguished as a new species.

Further up, we found our goal. A large tree had fallen near the path and there was a plant of *N. inermis* growing on it. Only a *Nepenthes* fanatic could find this plant as amazing as we did—it has no peristome, little colour and is very small (Figure 6). Nonetheless, it is up there with the best species in my opinion. A few articles have discussed the possible prey-trapping mechanisms of this plant (see Hopkins *et al.* (1990) and Salmon (1993)). Salmon (1993) suggested that the pitcher secretes compounds which serve to intoxicate insects which land on the lid. These are then rendered paralysed and cannot move even if you touch them. He also suggested that the extreme viscosity of the pitcher fluid helped prevent the contents being washed away by rain.

In the wild, I noticed that the entire inner surfaces of *N. inermis* pitchers have a thin covering of pitcher fluid, which is so viscous that it feels sticky in the same way as the mucilage on the tentacles of *Drosera* species. We saw several insects



Figure 1: A lower pitcher of *N. ovata*. Photo by Charles Clarke.



Figure 2: A large upper pitcher of *N. sumatrana*—this one was about 30 cm height. Photo by Charles Clarke.



Figure 3: A lower pitcher of *N. gymnamphora*. Photo by Charles Clarke.



Figure 4: A lower pitcher of *N. bongso*. Photo by Charles Clarke.



Figure 5: An upper pitcher of *N. longifolia*. Photo by Charles Clarke.



Figure 6: An upper pitcher of *N. inermis*. Note the prey in the bottom of the pitcher (in silhouette). Photo by Charles Clarke.

trapped on the upper parts of the pitchers (on the inside) by this mucilage. They could not break free from it and were in the process of sliding into the pitcher. Because the fluid also acts as a lubricant, the captured insects slide down into the narrow base of the pitchers very easily. There, the walls of the pitcher are so tightly pressed together that there is no chance of rainwater washing the contents out. Presumably, this is where the prey are digested. It would be very interesting to see whether the secretions on the lid do in fact contain substances which are intoxicating to insects; whatever the case, the pitchers have a very sweet and aromatic smell. Although controlled experiments would be required to prove exactly how *N. inermis* pitchers work, it seems to me that they function partly as pitfall traps and partly as flypapers. Regardless of the final outcomes of such experiments, there is no doubt that *N. inermis* is one of the most unusual and remarkable of all *Nepenthes*.

The next plant we saw on Gunung Talang was *N. talangensis*. For a long time, people thought that this was *N. bongso* (see Hopkins et al. (1990), p. 23). This may have been due in part to the considerable confusion among horticulturists regarding the differences between *N. bongso*, *N. carunculata*, *N. pectinata* and *N. singalana*. Some of this confusion was resolved by Schlauer & Nerz (1994) but the differences between *N. bongso* and *N. carunculata* are still difficult to interpret (see below). *N. talangensis* was named by Nerz and Wistuba (1994) and it is not known from anywhere else. It is very common in the mossy forest near the top of G. Talang, but also occurs lower down. We saw some plants at 1800 metres. At first, we thought these looked like natural hybrids of *N. gymnamphora* and *N. inermis*. They certainly do have an intermediate appearance, but once we saw more of them higher up the mountain, it became clear that they were not hybrids. The mossy forest on the summit ridges of G. Talang is very easy to walk through, as there are many tracks formed by tapir, a large black and white coloured mammal, about the size of a large pig, which is found in Sumatra and Peninsular Malaysia.

On the way down the mountain, we saw a couple of very large *Nepenthes* plants, the first of which we decided (without much conviction) was a true *N. bongso*. Having not seen a clear-cut example of *N. carunculata* on the trip, I cannot honestly say that I understand the differences between this species and *N. bongso*. *N. carunculata* usually but not always has an appendage on the underside of the lid, towards the apex. However, because this is not always present and the other differences with *N. bongso* are slight, I could not be 100% sure of our identification.

Back to North Sumatra

Our final goal was to look for another plant which was partly (and invalidly) described by Tamin and Hotta (1986)—*N. spinosa*. The description of this species is yet to be sorted out, but we had time to have a quick look for it near Solok. This attempt turned out to be unsuccessful as well, but we did see a lot of *N. reinwardtiana*. As we had to get back to Medan to meet our flights back home, we started the long drive north, taking a different route so as to avoid visiting Sibolga again! We drove around the base of Gunung Talakmau, in case we wanted to climb it at some later date and there we found a few plants of *N. mirabilis* growing by the road. From there we went back to Lake Toba and on to Medan. In ten days, we saw eighteen species of *Nepenthes*, which was not bad going at all. While it is clear that there is still some confusion about certain species from Sumatra, the situation is a lot better than it was a couple of years ago, thanks largely to the sensible approaches taken by Nerz, Wistuba and Schlauer in describing new species.

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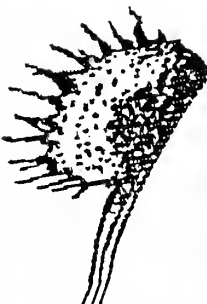
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News & Views

“Ernest” KAM Chuen Hwee (Block 48 Telok Blangah Drive, #02-113, Singapore 100048, Rep. of Singapore)

I have spoken to a curator at the Singapore Zoological Gardens and he has informed me that they have plans to reintroduce *Nepenthes* back into the wild. To date they have about two hundred *Nepenthes* of the three species and two hybrids that occur naturally here. They have taken cuttings of their plants and have attempted to reestablish the propagated plants back into habitats where they have supposedly become extinct. Unfortunately the plants do not seem to survive, which is a blow on their conservation efforts.

I wonder if it is possible for me to initiate some discussion into the subject on the reintroduction of CPs back into their native habitats with emphasis on the methodology. Letters with suggestions could be addressed either to me, or to the curator himself at the following address: Mr. Melvin TAN, Singapore Zoological Gardens, Attn.: Horticultural Dept., 80 Mandai Lake Road, Singapore 729826, Rep. of Singapore.

My feeling is that the horticultural department would be most grateful. Believe me when I say that they need all the help they can get. Though I do not know exactly how dedicated they are towards such a project, my belief is that with the support by CPers worldwide, they will be spurred on to put in their very best.

Perhaps if you could provide us with contacts of organizations with similar projects we could further the cause of the conservation of *Nepenthes* here in a location where rapid urbanization is destroying most of their natural habitats.

Alan S. Jellson (34 Paradox Drive, Worcester, MA 01602-1321)

I am adding a brief addendum to my recent article (CPN 25:3). 1) On CPs requiring a dormant period, they may be lightly fertilized with a high potassium (tomato) fertilizer to further improve their rest period, eight weeks before expected frost. For CPs potted as house-plants, a spray of mentioned enhancer, diluted 30%-50% of said mister, sprayed sparingly on leaves, about 5-6 weeks apart, is helpful. 2) Freshly repotted CPs with my ‘*Sphagnum* moss spray method’ should be watched about a week for accelerated moisture absorption and corrected accordingly. 3) Tree fern roots may be added to the bottom of the mixture to further regulate water levels and provide trace minerals availability for plant uptake, applied thinly. 4) CPs should be repotted with fresh media, once yearly to encourage optimum root development and growth. It is not necessary to completely bare root your plants, unless disease or infestations require further action. 5) Lower light intensity, photoperiod, water access appears to influence dormant initiation. If temperature for CP characteristic #1 remains constant; water care must be near/at rest times or botritis mold will swiftly spread. 6) Lastly, as a sad commentary of the times, my security measures are upgraded to protect my collection.

Don Schnell (Rt. 1, Box 145C, Pulaski, VA 24301)

Don reports an update on the item sent to us by McRoberts and printed in the June, 1996 issue of CPN (CPN 25:48). The problem was that the US Forest Service (USFS) was quietly preparing to transfer most of the Vernon District of the Kisatchee National Forest to the US Army at Ft. Polk in Louisiana. This district contains the last rare pine stands of the region. Whatever persuaded the USFS to want to do this for the Army has never been clarified. In either event, it was imper-

ative that efforts be made to preserve this land, or at least prevent rough use by the military in training, mostly foreign troops at that! In the January/February 1997 issue of International Wildlife (27:9), it was reported that the National Wildlife Federation and its Louisiana affiliate had defeated the proposal in Congress to allow this transfer of 85,000 acres on the basis that proper environmental impact studies had never been done, and a public hearing had never been accomplished.

Joseph Yeo (60 Toh Tuck Road #02-08, Singapore 596723, Republic of Singapore)

I went on a field trip to Johore, Malaysia, on the 9th of August to find *Nepenthes*. Most of the local lowland species I found were identified (*N. rafflesiana*, *ampullaria*, and *gracilis*). Several hybrids were also found—*N. gracilis* × *rafflesiana*, *N. × hookeriana*, and *N. × trichocarpa* (the last two hybrids are *N. rafflesiana* × *ampullaria* and *N. gracilis* × *ampullaria* respectively—ed.). The natural hybrid *N. gracilis* × *rafflesiana* is rarely seen in nature. Several forms of *N. rafflesiana* (black and spotted), *N. gracilis* (pink to maroon), *N. gracilis* (all green and green upper pitchers, maroon lower pitchers), and *N. ampullaria* (green and spotted), were found along a 1-1.5 km stretch, except for 200 metres of very dry ground where *N. gracilis* (small pink form) was found only. Otherwise, the three species and hybrids can be found growing together.

I also managed to collect seed of *N. ampullaria*, *N. gracilis* and *N. × hookeriana*. I have sown some and distributed most of them to growers and CP societies. I have also sent some to the ICPS seed bank.

Some of the *N. hookeriana* have very nice lower pitchers. They look like fat and stunted *N. rafflesiana*. Another rare occurrence is the upper pitcher of *N. ampullaria*. The upper pitcher of *N. ampullaria* is seldom seen in its natural habitat. I enclosed a picture of the *N. ampullaria* sighted. The picture shows a male flowering *N. ampullaria* with the two upper pitchers. The other photos were taken from the same field trip.

(Joseph wrote that he is interested in contacting other *Nepenthes* growers for exchange of seed and information. His address is 60 Oh Tuck Road #02-08, Singapore 596723, Republic of Singapore—ed.)

Literature Review

Adamec, L. 1995. Ecological requirements of *Aldrovanda vesiculosa*. Testing of its new potential sites in the Czech Republic. Acta Bot. Gallica 142: 673-680.

Adamec, L. 1995. Ecophysiological study of the aquatic carnivorous plant *Aldrovanda vesiculosa* L. Acta Bot. Gallica 142:681-684.

These two closely related and consecutively appearing papers relate valuable information on *Aldrovanda* in its natural habitat—in this case, Poland—as well as requirements for growth and metabolism. In the first study in an attempt to determine the possibility of naturalizing the species in the Czech Republic, either five or ten plants were placed in each of ten selected sites that resembled the locations in Poland where the species is still found, although in smaller numbers now due to mysteriously decreasing turion survival. The plants were originally obtained from Poland but were cultivated by the author and these cultivated

plants were the source of explants. During the warm summer, growth was quite successful in most locations with the 5-10 plants resulting in 38-141 turions per site by summer's end. The most suitable locations contained sedges in the water with duff and rotting plant debris on the bottom.

Waters were broadly circumneutral, had low NPK but higher levels of NH_4 and CO_2 .

In the second paper, some basic studies were undertaken that indicated that the plants did best under highlight and warmth. Turions survived well over winter in waters of 4° C, but were killed when stored on moist filter papers or emptied growing containers when the temp dropped to -12° C.

It would be interesting to see the latter experiment extended to finer temperature gradations over a larger range, and noting the effects of storing the turions in neutral waters open to air. Even at -12° C, the turions might survive in sufficiently deep ice-covered water if there is still unfrozen water at the bottom where the turions rest.

Both papers are well done and should be read by those interested in this species for more detail than we can provide here. (DES)

Ellis, A.G. and Midgley, J.J. (1996) A new plant-animal mutualism involving a plant with sticky leaves and a resident hemipteran insect, *Oecologia* 106: 478-481

The headline of this important paper is somewhat misleading because the relationship between *Roridula* and bugs of the genus *Pameridea* is by no means new (cf. Lloyd, *The Carnivorous Plants*: 98, 1942), and the much more interesting findings of this article relate to physiology rather than ecology. There were five results of importance. 1. *Roridula* does not produce endogeneous proteolytic enzymes digesting captured prey (tested by a substrate film method). 2. *Roridula* captures considerable amounts of prey. 3. *Pameridea* finds and attacks any newly caught prey within minutes. 4. Labelling experiments with the stable nitrogen isotope ^{15}N showed that the nitrogen is translocated from prey to *Roridula*. The amount of this translocation was greatest in individuals of *Roridula* which were beset with *Pameridea*. 5. The authors suggest that excrements of *Pameridea* on the abaxial leaf surface are absorbed by *Roridula*.

Despite some errors (*Byblis* is reported to lack digestive enzymes although this has not been tested since the positive preliminary results by A.N. Bruce, *Not. Roy. Bot. Gard. Edinb.* 16:9-14, 1905; so a study similar to the present one is clearly indicated for *Byblis*!) this paper puts an end to some of the ongoing myths about carnivory in *Roridula*. The genus can be regarded as essentially noncarnivorous based on the fact that endogeneous digestive properties are definitely lacking (demonstrated here for the first time). The authors close: "Our results elevate *Roridula* to being the tallest (up to 2 m tall) and woodiest carnivorous plant. Darwin (1875) was right about *Roridula*, but for the wrong reason". However, *Triphyophyllum peltatum* (Dioncophyllaceae) is a liana, several tens of metres tall and woody in adult individuals (which are, however usually not carnivorous in this stage of development), and *Roridula* is only sub-carnivorous (in community with *Pameridea*). Ellis and Midgley (1996) were right about *Roridula*, but with wrong conclusions. (JS)

Fagerberg, W.R. and Howe, D.G. (1996) A Quantitative Study of the Tissue Dynamics in Venus's Flytrap *Dionaea muscipula* (Droseraceae). II. Trap Reopening, American Journal of Botany 83(7): 836-842.

This paper is a continuation of a previous one (Fagerberg & Allain, Am. J. Bot. 78:647-657, 1991) in which trap closure of *Dionaea muscipula* was studied. The authors have used normalized cell length (NCL) measurements of five cell layers and three trap regions of the trap lobes at various stages of reopening in order to elucidate tissue dynamics during this process. They found significant changes in NCL corresponding to the macroscopic morphological changes observed. The important point is that cells from adjacent layers within all regions of the trap lobes change at different rates during different stages. Once again, no physiological reason for the changes observed could be determined. The complex sequence of events is not a simple reversion of the likewise complex sequence observed in trap closure. No "motor cells" could be detected. As a result it can be summarized that in spite of considerable amounts of data obtained (not only in the present paper), the various (fast and slow) trap movements of *Dionaea* still remain far from being understood satisfactorily. (JS)

Godt, M.W. and J. L. Hamrick (1996) Genetic structure of two endangered pitcher plants, *Sarracenia jonesii* and *Sarracenia oreophila* (Sarraceniaceae), Am. J. Bot. 83: 1016-1023.

Regarding some aspects of taxonomy, pollination and insect associates, the bibliography of this paper is woefully incomplete and therefore some factual and/or technical errors have crept in. However, the basic thrust of the work is to determine the degree of genetic diversity of these two entities. Genetic diversity is important since those plants with low diversity will have less genetic "reserve", as it were, to respond to changes in environment and thus not do well. There is no direct or easy way to determine true diversity. The authors used a standard surrogate procedure of determining the isoenzymatic constituency of a small selected group of enzymes using electrophoresis. This procedure correlates with diversity in some plant species but not all and has limitations. Pitchers were collected from multiple sites, enzymes extracted and studies done. A brief summary of results indicates that overall genetic diversity is low for both species but especially critical for *S. rubra* subsp. *jonesii*: within each taxon, individual determinations from each location indicated that larger populations had greater diversity while smaller had less, as one might expect. (DES)

Luhers, Hans. 1995. New additions to the genus *Pinguicula* (Lentibulariaceae) of Mexico. Phytologia 79:114-122.

They keep on rolling in! Two more new species of *Pinguicula* in old Mexico. Many more, and the genus in that country will be ripe for a monographic revision.

P. stolonifera has a unique character for Mexican *Pinguicula*: It forms a stolon with new plant budding at the tip, often more than one stolon per plant. The flower is red-purple and the species is placed in the section *Orcheosanthus* and seems most closely related to *P. oblongiloba*.

P. laxifolia is a smallish plant with pink or pale violet flowers and is so unique in several characters as to justify the new section *Orchidioides*, which is also

described. We are getting so many of these things that more sections are needed! The author presents cogent reasoning for the new section and suggests that several other Mexican species should be transferred to the new section. This is a well-done paper with very good descriptions and line drawings.

Stay tuned for more species! (DES)

Seine, R., et al. 1995. A neglected habitat of carnivorous plants: Inselbergs. *Feddes Repertorium* 106:555-562.

Inselbergs (the term monadnock is more commonly used in the US) are raised domes of granitic or gneiss rock that loom up over the countryside. They have persisted because they are more resistant to erosion. There is much bare rock on their surfaces, but crevices, dips, folds and cracks support a very thin soil in which often unusual plants grow. There are seasonal pools, seasonal seeps from beneath layers of mosses and occasional seasonal rivulets of runoff water. Most inselbergs occur in the tropics and their harsh, demanding habitat would seem an unlikely place for moisture loving CP, but they can thrive seasonally and lie dormant during drier times. The authors mention four genera (*Drosera*, *Utricularia*, *Genlisea* and *Nepenthes*) with 45 species that regularly occur on inselbergs throughout the world. These are listed by country. The authors discuss whether *Heliamphora* on tepui should also be considered. In the southeast United States, there is a series of monadnocks, most prominently a string beginning with Stone Mountain near Atlanta, Georgia, running through Rocky Face in Alexander County, North Carolina, and on to flatter domes near Raleigh. In the US, the only CP found in such situations are *Utricularia juncea* and *U. subulata*. (DES)

Worley, A. C. and L. D. Harder. 1996. Size-dependent resource allocation and costs of reproduction in *Pinguicula vulgaris* (Lentibulariaceae). *J. of Ecol.* 84:195-206.

Two sites where *P. vulgaris* grows in Alberta, Canada, two opposite shady shores of the same river, were monitored. Energy allocation to growth varied negatively to plant size. The larger the plant, the less it grew in a season. But resource allocation for gemmae production (the little side buds on the winter hibernacula) and seed biomass produced varied positively with plant size: The larger the plant, the more seed and gemmae. Smaller plants did produce seed-bearing flowers and gemmae, but fewer seed and buds than larger plants did. Reproduction affected vegetative propagation and growth independently, growth was favored over vegetative reproduction, and reproduction was quite costly. (DES)

Book Review

Insectivorous Plant Society (Japan) (1996) *Carnivorous Plants—Species and Cultivation*, 170 pp., Nippon Dental College, Tokyo. ISBN4-416-496001

This Japanese publication adds another profusely illustrated compendium covering (almost) all groups of carnivorous plants to the works of similar scope. Nevertheless, it deserves special attention. The booklet contains no less than 316

colour and 41 black and white photographs, some of which show plants rarely or not at all illustrated previously, thus this book even rivals "Carnivorous Plants of the World in Colour" by M. Kondo & K. Kondo. The text is entirely in Japanese but scientific (Latin) plant names are used in all figure captions of the colour photographs. *Triphyophyllum peltatum* (Dioncophyllaceae) is not mentioned, although this plant is carnivorous, while numerous sub-carnivorous species (Bromeliaceae, *Ibicella*, *Roridula*) are featured. Some of the plants depicted are not accurately identified but the book can still be recommended as a quick reference to even less frequently cultivated carnivorous plants. It should not be missing in the library of the devoted enthusiast. (JS)

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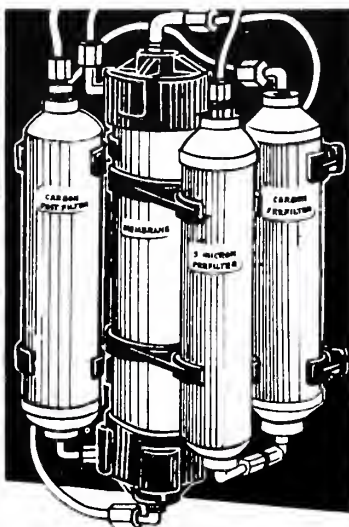
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Two New *Nepenthes* Cultivars (Nepenthaceae)

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P.O. Box 193
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Keywords: cultivar: *Nepenthes*

The first of these two new cultivars is 'Shivas Regal,' a distinctive hybrid between *Nepenthes sanguinea* red form and *Nepenthes tobaica* red form. It is named after the breeder, Mr. Don Shivas of Queensland, and was made in the late 1980's. The second is 'Nighttime Regal' and is a large, dark purple form of *Nepenthes gracilis* which was selected from material collected at Bau in Sarawak, Borneo.

N. sanguinea × *N. tobaica* cv. 'Shivas Regal'

(Figure 1) This plant is a climbing vine similar in growth to *N. tobaica* but larger in all respects. Leaves are sessile to partly decurrent, leathery, 20 cm long and 3 cm wide. Stems are singular in being almost square in cross section. In high light leaves assume maroon colour. Lower pitchers are purple-maroon in colour, to 20 cm in length, 5 cm in width, tubular with lower third ovate. Spur undivided. Wings, two toothed as in *Nepenthes tobaica*. The mouth is teardrop shaped, angled, the peristome dark purple in colour, and as with *N. sanguinea* devoid of distinct teeth on the inner margin. The inner surface of the throat is mottled with light red and green. The lid is elliptical, dark purple in colour. Upper pitchers are like those of *Nepenthes tobaica*, square fronted with toothed wings absent. The mouth becomes more square in shape, the peristome finer in detail. The colour becomes lighter mottled with yellow and green all over. The leaves are lanceolate to 20 cm long, dark green in colour. This hybrid prefers cooler temperatures, thriving in highland conditions. It is a difficult plant to propagate by cuttings.

N. gracilis cv. 'Nighttime Regal'

(Figure 2) The leaves are very dark green, lanceolate, 4 cm wide, 20 cm long, speckled maroon on the under surface. The lower pitchers are typical of *Nepenthes gracilis* with darker purple flecks which are cylindrical in shape, 6 cm in length, 1.5 cm wide. The small cylindrical peristome is green and purple in colour. The upper pitchers are remarkably larger than typical *Nepenthes gracilis*, 12 cm in length, 3 cm in width, dark red to maroon turning almost brown with maturity. The lid is elliptical and wider than the mouth with maroon on both surfaces. The mouth is orbicular and almost flat with a fine cylindrical peristome, green with occasional red stripes. The inner surface of the pitcher is green with red flecks. Two toothed wings are found on the full length of the pitcher. The tendrils are 16 cm long.

An unusual, vigorous plant that produces larger and darker coloured upper pitchers the taller it gets, being a feature opposite to most other *Nepenthes*. It grows well in lowland conditions and takes easily from cuttings.

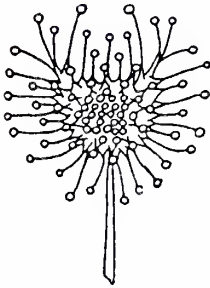


Figure 1: *N. sanguinea* × *N. tobaica* cv. 'Shivas Regal'



Figure 2: *N. gracilis* cv. 'Nighttime Regal'

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Keywords: cultivation:general

A Nepenthes in your living room? Sundews over your kitchen sink?
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Twenty years ago many carnivorous plant enthusiasts would have raised eyebrows over such possibilities, assuming that to grow a CP indoors, terraria would be a requirement. Not necessarily so. From London to New York to San Francisco to Melbourne, many carnivores are finding happy homes in people's houses and offices, requiring minimal care while offering maximal pleasure.

This does not mean you can grow a Venus' flytrap wherever you grow a parlor palm. Most houseplants are cultivated for their low light tolerance, and

in fact may dislike or be burned by direct sun. CPs are sun lovers, and this is perhaps the most important fact to consider when choosing carnivores to grow indoors. I use the term windowsill to stress this point. Most carnivorous plants, to be successful indoors, usually need to be as close to a window as possible. A windowsill or tabletop next to the glass is the brightest place in a room, which is what CPs typically require.

Furthermore since most carnivores are sun-lovers, direct sunshine streaming through the window for at least part of the day is also a necessity, although there are a few exceptions. Direct sun should hit most CPs a minimum of two to five hours during the growing season. Keep in mind that the sun moves about in the sky from season to season. Thus there are few windows that receive the same amount of sun most of the year. Many people in the northern hemisphere assume south-facing windows are the sunniest, but this may only be true in the winter when the sun is low in the sky. When the sun moves directly overhead, a window with southern exposure may receive no direct sun at all especially if your house has a roof overhang.



Figure 1: "*N. khasiana*, *D. capensis* 'alba', and *P. moranensis* at the home of the author. Photo by Sharon Bergeron."

Most growers have found that east or southeast windows which receive cooler morning sun are probably the best indoor location for CPs. West and southwest facing windows are also quite good, but if the afternoon sun is too hot in your house, screening or sheer curtains may be needed to make the sunlight less harsh and to

keep the plants from burning.

There are several things to consider when growing carnivorous plants indoors. If you wish to grow temperate plants, such as the Venus' flytrap or American pitcher plant, you must heed their dormancy requirements. The shortening of the daylight period triggers the plant's rest period. Dormancy also requires cooler temperatures. It may not require temperatures as cold as the plant may experience in its native habitat, but dormant plants should be protected from hot sun and warm temperatures. It is therefore wise to move such dormant plants outdoors, if your climate can sustain them, or perhaps to the coolest north-facing windowsill. Choose a room that is not overly heated, especially at night. Basement and garage windowsills can fill this requirement, as can enclosed porches that get cold in the wintertime.

Some folks who have no such environment to place dormant plants may

instead remove the plant from its soil and store the rhizome in a resealable plastic bag after trimming whatever leaves may be remaining on the plant late in the season. A few strands of damp, long fiber *Sphagnum* moss or a handful of moist peat moss can be added to the bag, and then refrigerated over winter. Come late winter, the rhizome is repeated and the plant returned to the windowsill.

Minimum dormancy for temperate plants should be around three months. In the U.S., remember that plants should enter a rest period some time between Halloween and Thanksgiving (November) and can be brought out of dormancy as early as Valentine's Day in the middle of February, but no later than Easter. By the approach of spring in March, the well-rested plants will begin the season's growth.

Of course, many subtropical and warm-temperate CPs will continue to grow through winter and will not require a cold rest period, although they may slow their growth. These plants, like *Cephalotus* or Cape sundews or the Mexican butterworts, will be happy year-round on the windowsill. You may want to grow such plants on a sunny south-facing window in winter, and if the sun disappears there by spring, move the plants to an east or west window for summer.

Alternatively, you may grow plants outdoors in the summer and then move them to a sunny windowsill for winter, to protect them from unsuitably cold weather. You might live in a city like Boston and grow Mexican butterworts or Cape sundews outdoors for the summer, then move them to a windowsill before the first frosts. Remember, if you do this with a Venus' flytrap or yellow trumpet plant (*Sarracenia flava*) because your winters are too cold to leave them outdoors, be sure you respect their rest periods and keep them in a cool and sunless window.

Success with windowsill growing may depend on where and how you live. Humidity is certainly important for carnivorous plants indoors, but not as important as good light. If you live near a coastline, indoor humidity is often suitable for CPs. If you live in a desert community, air-conditioning or evaporative coolers will often help windowsill plants. In winter, heating your house may lower humidity drastically, especially with energy sources such as wood stoves. You may want to keep a kettle on your wood stove to replenish water vapor.

Misting indoor CPs can be quite beneficial, and I recommend you keep a spray-bottle of purified water near your plants if your house is on the dry side. Wetting the foliage in the morning and evening would be appropriate if your humidity is low.

Here are some suggested plants for the windowsill, if conditions are appropriate. You can grow the Venus' flytrap, most Mexican butterworts and *Sarracenia* species and hybrids (although they will require much direct sun). Most terrestrial and epiphytic bladderworts that are subtropical to tropical in origin (such as *U. livida*, *sandersonii*, *reniformis* and *humboldtii*) and aquatics like *U. gibba* will thrive. Other suitable plants are *Cephalotus*, *Byblis liniflora*,

sundews (such as rosetted subtropicals, Cape sundews, *D. regia*, and *D. binata*). *Darlingtonia* will do well if your house is cool. Try highland *Nepenthes* such as *N. khasiana*, × 'Rokko', *alata* and *ventricosa*, and their hybrids. Some lowland hybrids can also do surprisingly well, like the beautiful *N. × dyeriana*, which has some highland ancestry.

International Carnivorous Plant Conference

May 16-20, 1997

hosted by

Atlanta Botanical Garden and the International Carnivorous Plant Society
Held at The Atlanta Botanical Garden, Atlanta, Georgia, USA

Proposed Agenda

Thursday, 15 May, 1997, 6.30pm

Welcome buffet & late registration

Friday, 16 May, 1997, 8.00am-6.30pm

Six Speakers from around the world including Prof. K. Kondo on 'Habitat management and in & ex situ conservation of CPs in Japan' and Dr. Martin Cheek, RBG, Kew, UK on 'Diversity within the genus *Utricularia*'. Followed by poster session, plant sale (only artificially propagated plants) and tour of ABG CP collection

Saturday, 17 May, 1997, 8.00am-5.00pm

Six Speakers throughout the day followed by ABG CP collection tour

Sunday, 18 May, 1997, 8.30am-3.45pm

Six Speakers throughout the day

Monday, 19 May - Tuesday, 20 May, 1997

Two day field trip to visit CPs in Georgia and surrounding states

Registration

Registration will cover welcome buffet, continental breakfast, breaks and box lunch and drink throughout the conference

*Registration **\$65.00**

*Field Trip (limited to 50 places) **\$120.00**(inclusive of accommodation, travel and food)

The conference organizers are not responsible for securing plant import/export permits and all delegates are responsible for travel, medical, and car rental insurance.

Please address inquiries to:

International Carnivorous Plant Conference

c/o Steve Baker

5029 West Piedmont Circle

Conover, NC 28613, USA

Day: 704-322-2050 9am - 5pm

Evening: 704-256-7035 7pm - 10pm

The Pool of Forgotten Warriors

WILLIE FINLEY

The remnants of the thunderstorm have long passed;
one by one, a series of raindrops continue to drip off the upper
forest canopy and strike repeatedly against the
leaves of plants that thrive below.

Far below, on the surface of soggy peat,
a miniature puddle has collected within
the cavities of a low-lying killer.

The grotesque appearances of the numerous, pubescent sacks
display little intimidation amongst
the creatures of the bog.

The fluted lips, consisting of green and red, and the
pleasant perfume of rich nectar tempt many a creature
from their dark recesses.

As the rays of the Australian sun grow stronger with intensity,
the odor emanating from the depths of the lotus' parlors
increases as well.

A black ant, a warrior in his own right, cautiously
climbs a spiked ladder and drinks the wine
of the eccentric lotus.

He soon feels dreamy and whirls and dances about
on the ornamental lips of the pitcher plant.

"Oh there's more my friend; please come inside and help thyself."

The ant is entranced by the generous advice and enters an orifice covered with pale
walls—

to take yet another sip of nectar.

*"Dear Cephalotus, thy drink is indeed fair. I remember
not where my home is located and so I will stay
here and drink for days on end."*

The intoxicated creature then stumbles before
dropping into a translucent pool in the lower
section of the chamber;

He struggles and twitches until alas—he moves no more.

*"Ah my friend, fear not, thou shall not return home again.
Thou shall rest with thy brothers and abide
in this magnificent hall of delights."*

The black, drugged corpse slowly sinks to
the bottom of the watery tomb—and joins
the bodies of six other warriors and travelers who
also took one sip too many.

*"Come one, come all, come and taste the nectar that
I've prepared for thee,*

*I know you'll want to drink a great
amount of it... and you're welcome to stay
for all eternity."*

ICPS SEEDBANK

TOM JOHNSON, Coordinator
P.O. BOX 12281, Glendale, CA 91224-0981
Updated January 24, 1997

Byblis gigantea	D. binata complex Dichotoma small
Byblis liniflora	D. brevifolia white flower Hampstead, NC
Darlingtonia californica	D. burkeana
Darlingtonia californica Florence OR	D. burmannii
Dionea muscipula	D. burmannii 'Beerwah, Qld'
Nepenthes alata Phillipines	D. capensis
N. maxima "Gunung Tlatawiran, N. Sulawesi"	D. capensis "green"
Utricularia bisquamata 1 pkt	D. capensis "wide"
U. dichotoma 'Esperance'	D. capensis "narrow leaf"
U. gibba	D. capensis "white flower" or alba
U. subulata	D. capensis "purple flower"
U. subulata large flower	D. capensis "red"
S. flava	D. capensis "large"
S. flava "purple throat"	D. capillaris
S. flava Ben Hill Cty, Georgia	D. dielsiana
S. flava typica New Bern, N.C.	D. esmeraldae
S. flava "Copper Top"	D. filiformis filiformis
S. flava "green with yellow tops"	D. indica white from Japan
S. leucophylla	D. intermedia
S. minor Fitzgerald, Georgia	D. intermedia Carolina Giant
S. psittacina	D. intermedia v. US
S. purpurea purpurea	D. macrantha macrantha
S. rubra	D. marchantii marchantii
S. X alata x leuco	D. montana
S. X flava x (alata x leucophylla) Ltd	D. natalensis
S. X flava X oreo	D. nidiformis
S. X leucophylla x (flava x leucophylla) Ltd	D. rotundifolia Florence, OR
S. X (leucophylla x flava) x (leucophylla x rubra) Ltd	D. rotundifolia Rochester NY
S. X (leucophylla x rubra wherryi) x self	D. sessifolia
S. X (oreophila x purpurea purpurea) x self	D. spatulata
S. X purpurea x alata Ltd	D. spatulata Kowloon Peak, Hong Kong
S. X (purpurea x oreophila) x self	D. spatulata Hairy Sepals, Gympy Qld
S. X (purpurea x psittacina) x self	D. spatulata pink flower
S. X purp purp forma heterophylla x oreophila	D. spatulata pink Kanto
S. X purp purp forma heterophylla x (purp x psit)	D. spatulata v. Kansai from Japan
S. X purp purp forma heterophylla x "adesugata"	D. spatulata Mt. Bartlefreare, QLD
S. X purp venosa x (rubra jonesii x purpurea)	D. spatulata Mihama Town, Chubu District
S. X ((Rubra gulf x leuco) x flava) x self	D. spatulata Kopotai, NZ
Drosera adelae	D. species Magaliesburg
D. aliciae	D. venusta
D. auriculata	D. X dielsiana x Sp. Transvaal
	D. X thelocalyxiana (burn X sessilifolia)

All seed contributions are gratefully accepted. Please forward to the above PO Box. Please protect the seeds from postal abuse. I use bubble wrap, although it does require an additional eleven cents in postage (within US). Note: Ltd. means the seeds are in very limited supply.

Please mail comments to: tjohns@primenet.com

You can also visit Tom's Web Page at

<<http://www.primenet.com/~tjohns/index.htm>>
to get the most up to date Seedbank List.

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Instructions to Authors

BY THE EDITORIAL STAFF

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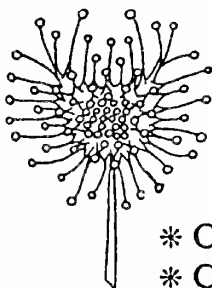
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